

CLAIMS:

1. A semiconductor processing method of chemical vapor depositing SiO_2 on a substrate comprising:

placing a substrate within a chemical vapor deposition reactor;

feeding an organic silicon precursor into the chemical vapor deposition reactor having the substrate positioned therein under conditions effective to decompose the precursor into SiO_2 which deposits on the substrate and into a gaseous oxide of hydrogen; and

feeding an additional quantity of the gaseous oxide of hydrogen into the reactor while feeding the organic silicon precursor into the reactor.

2. The semiconductor processing method of claim 1, wherein the organic silicon precursor and the additional quantity of the gaseous oxide of hydrogen are fed into the reactor from separate feed streams.

3. The semiconductor processing method of claim 1, wherein the organic silicon precursor and the additional quantity of the gaseous oxide of hydrogen are fed into the reactor from a common feed stream.

1 4. The semiconductor processing method of claim 1, wherein
2 the feeding steps collectively comprise:

3 mixing a quantity of the organic silicon precursor in liquid form
4 and a quantity of the oxide of hydrogen in liquid form to form a liquid
5 mixture;

6 converting the liquid mixture to a gaseous mixture; and
7 feeding the gaseous mixture into the reactor.

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9 5. The semiconductor processing method of claim 1, wherein
10 the feeding steps collectively comprise:

11 mixing a quantity of the organic silicon precursor in liquid form
12 and a quantity of the oxide of hydrogen in liquid form to form a liquid
13 mixture, the quantity of the organic silicon precursor being greater by
14 volume than the quantity of the oxide of hydrogen;

15 converting the liquid mixture to a gaseous mixture; and
16 feeding the gaseous mixture into the reactor.

1 6. The semiconductor processing method of claim 1, wherein
2 the feeding steps collectively comprise:

3 mixing a quantity of the organic silicon precursor in liquid form
4 and a quantity of the oxide of hydrogen in liquid form to form a liquid
5 mixture, the quantity of the oxide of hydrogen comprising between about
6 5%-15% of the liquid mixture volume;

7 converting the liquid mixture to a gaseous mixture; and
8 feeding the gaseous mixture into the reactor.

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10 7. The semiconductor processing method of claim 1, wherein
11 the feeding steps collectively comprise:

12 mixing a quantity of the organic silicon precursor in liquid form
13 and a quantity of the oxide of hydrogen in liquid form to form a liquid
14 mixture;

15 converting the liquid mixture to a gaseous mixture, the converting
16 step including heating the liquid mixture to a temperature of between
17 about 65° C to 80° C; and

18 feeding the gaseous mixture into the reactor.
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1 8. The semiconductor processing method of claim 1, wherein
2 the feeding steps collectively comprise:

3 mixing a quantity of the organic silicon precursor in liquid form
4 and a quantity of the oxide of hydrogen in liquid form to form a liquid
5 mixture, the quantity of the organic silicon precursor being greater by
6 volume than the quantity of the oxide of hydrogen;

7 converting the liquid mixture to a gaseous mixture, the converting
8 step including heating the liquid mixture to a temperature of between
9 about 65° C to 80° C; and

10 feeding the gaseous mixture into the reactor.
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12 9. The semiconductor processing method of claim 1, wherein
13 the feeding steps collectively comprise:

14 mixing a quantity of the organic silicon precursor in liquid form
15 and a quantity of the oxide of hydrogen in liquid form to form a liquid
16 mixture, the quantity of the oxide of hydrogen comprising between about
17 5%-15% of the liquid mixture volume;

18 converting the liquid mixture to a gaseous mixture, the converting
19 step including heating the liquid mixture to a temperature of between
20 about 65° C to 80° C; and

21 feeding the gaseous mixture into the reactor.
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10. The semiconductor processing method of claim 1 wherein the organic silicon precursor is selected from the group consisting of silane, tetraethoxysilane (TEOS), diethylsilane (DES), tetramethylcyclotetrasiloxane (TMCTS), fluorotriethoxysilane (FTES), and fluorotrialkoxysilane (FTAS).

11. The semiconductor processing method of claim 1, wherein the chemical vapor deposition reactor is a hot wall reactor.

12. The semiconductor processing method of claim 1, wherein the chemical vapor deposition reactor is a cold wall reactor.

13. A semiconductor processing method of reducing the decomposition rate of an organic silicon precursor in a chemical vapor deposition process of depositing SiO_2 on a substrate within a chemical vapor deposition reactor comprising feeding at least one of H_2O and H_2O_2 into the reactor while feeding the organic silicon precursor.

14. The semiconductor processing method of claim 13, wherein the at least one of H_2O and H_2O_2 is fed into the reactor separately from the organic silicon precursor.

1 15. The semiconductor processing method of claim 13, wherein
2 the at least one of H_2O and H_2O_2 is injected into the reactor
3 separately from the organic silicon precursor, and comprises less than
4 about 50% by volume of material injected into the reactor.

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6 16. The semiconductor processing method of claim 13, wherein
7 the at least one of H_2O and H_2O_2 is injected into the reactor
8 separately from the organic silicon precursor, and comprises between
9 about 5% to 15% by volume of material injected into the reactor.

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11 17. The semiconductor processing method of claim 13, wherein
12 the at least one of H_2O and H_2O_2 is injected into the reactor
13 separately from the organic silicon precursor, and comprises less than
14 about 5% by volume of material injected into the reactor.

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16 18. The semiconductor processing method of claim 13, wherein
17 the feeding steps collectively comprise:

18 mixing a quantity of the organic silicon precursor in liquid form
19 and a quantity of the at least one of H_2O and H_2O_2 in liquid form
20 to form a liquid mixture;

21 converting the liquid mixture to a gaseous mixture; and

22 feeding the gaseous mixture into the reactor.
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1 19. The semiconductor processing method of claim 13, wherein
2 the feeding steps collectively comprise:

3 mixing a quantity of the organic silicon precursor in liquid form
4 and a quantity of the at least one of H_2O and H_2O_2 in liquid form
5 to form a liquid mixture, the liquid mixture comprising no less than
6 about 0.5% by volume of the at least one of H_2O and H_2O_2 ;

7 converting the liquid mixture to a gaseous mixture; and
8 feeding the gaseous mixture into the reactor.

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10 20. The semiconductor processing method of claim 13, wherein
11 the feeding steps collectively comprise:

12 mixing a quantity of the organic silicon precursor in liquid form
13 and a quantity of the at least one of H_2O and H_2O_2 in liquid form
14 to form a liquid mixture, the liquid mixture comprising between about
15 5% to 15% by volume of the at least one of H_2O and H_2O_2 ;

16 converting the liquid mixture to a gaseous mixture; and
17 feeding the gaseous mixture into the reactor.

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19 21. The semiconductor processing method of claim 13, wherein
20 the organic silicon precursor is selected from the group consisting of
21 silane, tetraethoxysilane (TEOS), diethylsilane (DES), tetramethylcyclo-
22 tetrasiloxane (TMCTS), fluorotriethoxysilane (FTES), and
23 fluorotrialkoxysilane (FTAS).
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1 22. The semiconductor processing method of claim 13, wherein
2 the chemical vapor deposition reactor is a hot wall reactor.
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4 23. The semiconductor processing method of claim 13, wherein
5 the chemical vapor deposition reactor is a cold wall reactor.
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7 24. A semiconductor processing method of chemical vapor
8 depositing SiO_2 on a substrate comprising:

9 placing a substrate within a chemical vapor deposition reactor; and
10 feeding an organic silicon precursor and feeding an oxide of
11 hydrogen into the chemical vapor deposition reactor having the substrate
12 positioned therein under conditions effective to deposit an SiO_2 layer
13 on the substrate.
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1 25. The semiconductor processing method of claim 24, wherein
2 the feeding steps collectively comprise:

3 mixing a quantity of the organic silicon precursor in liquid form
4 and a quantity of the oxide of hydrogen in liquid form to form a liquid
5 mixture, the liquid mixture comprising less than about 15% by volume
6 of the oxide of hydrogen;

7 heating the liquid mixture to a temperature sufficient to produce
8 a gas containing at least some organic silicon precursor and at least
9 some oxide of hydrogen; and

10 feeding the produced gas into the reactor.
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12 26. The semiconductor processing method of claim 24, wherein
13 the volume of material injected into the reactor has no more than
14 about 15% by volume of the oxide of hydrogen.
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16 27. The semiconductor processing method of claim 24, wherein
17 the volume of material injected into the reactor has between about 5%
18 to 15% by volume of the oxide of hydrogen.
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20 28. The semiconductor processing method of claim 24, wherein
21 the volume of material injected into the reactor has between about
22 0.5% to 5% by volume of the oxide of hydrogen.
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1 29. The semiconductor processing method of claim 24, wherein
2 the organic silicon precursor is selected from the group consisting of:
3 silane, tetraethoxysilane (TEOS), diethylsilane (DES), tetramethylcyclo-
4 tetrasiloxane (TMCTS), fluorotriethoxysilane (FTES), and
5 fluorotrialkoxysilane (FTAS).
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7 30. The semiconductor processing method of claim 24, wherein
8 the chemical vapor deposition reactor is a hot wall reactor.
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10 31. The semiconductor processing method of claim 24, wherein
11 the chemical vapor deposition reactor is a cold wall reactor.
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13 32. A semiconductor processing method of reducing the
14 formation of undesired reaction intermediates in a chemical vapor
15 deposition decomposition reaction of an organic silicon precursor into
16 silicon dioxide within a chemical vapor deposition reactor comprising
17 feeding at least one of H_2O and H_2O_2 into the reactor with the
18 organic silicon precursor.
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20 33. The semiconductor processing method of claim 32 wherein
21 the at least one of H_2O and H_2O_2 is fed into the reactor separately
22 from the organic silicon precursor.
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1 34. The semiconductor processing method of claim 32 wherein
2 the at least one of H_2O and H_2O_2 is first combined with the organic
3 silicon precursor, and then fed into the reactor with the organic silicon
4 precursor.

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6 35. The semiconductor processing method of claim 32, wherein
7 the organic silicon precursor is selected from the group consisting of:
8 silane, tetraethoxysilane (TEOS), diethylsilane (DES), tetramethylcyclo-
9 tetrasiloxane (TMCTS), fluorotriethoxysilane (FTES), and
10 fluorotrialkoxysilane (FTAS).

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12 36. The semiconductor processing method of claim 32, wherein
13 the chemical vapor deposition reactor is a hot wall reactor.

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15 37. The semiconductor processing method of claim 32, wherein
16 the chemical vapor deposition reactor is a cold hot reactor.

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38. A semiconductor processing method of chemical vapor depositing SiO_2 on a substrate comprising:

placing a substrate within a chemical vapor deposition reactor;

mixing a quantity of an organic silicon precursor in liquid form and a quantity of an oxide of hydrogen in liquid form to form a liquid mixture, the organic silicon precursor being selected from the group consisting of: silane, tetraethoxysilane (TEOS), diethylsilane (DES), tetramethylcyclo-tetrasiloxane (TMCTS), fluorotriethoxysilane (FTES), and fluorotrialkoxysilane (FTAS), the oxide of hydrogen being selected from the group consisting of: H_2O and H_2O_2 , the quantity of the oxide of hydrogen comprising between about 5%-15% of the liquid mixture volume;

converting the liquid mixture to a gaseous mixture by heating the liquid mixture to a temperature of between about 65°C to 80°C ; and

feeding the gaseous mixture into the reactor.